SELF CHECKOUT SYSTEM WITH AUTOMATED TRANSPORTATION CONVEYOR

FIELD OF INVENTION

The present invention relates generally to self-service checkout systems. More particularly, the present invention relates to a self-service checkout system having a powered item transportation/conveyor belt leading to an item processing and tendering module.

BACKGROUND OF INVENTION

The retail merchandiser, drugstore and supermarket industries have placed an impetus on reducing labor costs. Additionally they have expended energy in a variety of different ways to reduce or eliminate the amount of time required to process items to be purchased by a customer. To this end, there have been a number of self-service checkout system concepts developed which attempt to substantially eliminate the need for a checkout clerk. A self-service checkout system permits a customer to process and pay for their purchase with little or no retailer personnel assistance. Self-service has benefited consumers and retailers alike. Such systems have been widely adapted for purchasing gasoline at self-service service stations and are now becoming more available in retail stores. Self checkout models have a variety of features and benefits designed to make the self checkout process fast and easy. A variety of scanning and bagging (scan and item and place immediately in a bagging area) and

scan and pass (scan an item and place it on a belt which transports the item to a bagging area) have been introduced into the retail checkout market.

Commonly-assigned U.S. Pat. No. 4,676,343 and U.S. Pat. No. 4,792,018, hereby incorporated by this reference thereto, disclose systems for the automated checkout of articles selected by a customer for purchase in supermarkets and like facilities. The former patent involves an arrangement addressing articles which bear a so-called "universal product code" (UPC), typically in the form of a bar code uniquely indicative of the identity of the article bearing the code. The UPC of each article selected for purchase is scanned or read and a signal indicative of the article identity is generated and applied to a central processing unit (CPU) which has stored in associated memory storage for the UPCs of all articles available for purchase which are so encoded, correlated with the price and other characteristics of the articles, such as weight. Articles are placed on a conveyor following UPC scanning and thereby led into a "security tunnel", which is guarded against customer fraud by various light curtains, which are in the form of light sources and associated photocells. In the course of article conveyance, its weight is physically measured and a signal is generated indicative of the measurement.

Comparison is made of the stored, weight-indicative signal and the physical measured signal. If the comparison is negative, indicative of potential customer fraud, article processing is interrupted and various courses of action are obtainable, one being the reverse movement of the conveyor. Otherwise, in the course of continuing positive comparison results, the customer's order is carried forward, with price totalization effected from stored price-indicative signals.

In the latter patent, items are transported “down stream” from the scanning and payment area through the “security zone” and into a collection area. An additional item transport method is to have the belt positioned “up stream” from the scanning and payment area and place item directly into a secure collection area. Current “up stream” item transport methods require the self service operator to manually press a button to move items into position for scanning.

Current self-checkout systems require that customers scan, pay and bag orders by pulling items directly from a cart or basket and processing them for purchase. Moreover, while attendant only checkout areas include a conveyor at the front of the processing unit to make it easier to unload and stage orders for processing, these systems only allow the transportation of the staged items for processing via depressing of a manual button. This creates inefficiencies since the customer (in the case of a self-checkout system) or an attendant must engage the belt manually.

Placing an input conveyor belt at the front of self checkout station provides easier unloading and processing of items. However, current input belt self checkout systems have an item handling limitation: the input belt is operator controlled. Because such belts do not automatically move items as they are unloaded and scanned, they require manual intervention to position items close enough to the operator to reach them for scanning.

Accordingly, it would be advantageous to provide item transport system and method with a belt positioned "up stream" from the scanning and payment area that automatically moves items into position for scanning and tendering.

SUMMERY OF THE INVENTION

The present invention addresses the problems indicated above and presents methods and systems for transporting unloaded items in a self-checkout or attendant system, from a staging/loading area to a scanning and tendering unit (e.g., processing/checkout area) automatically without manual belt activation by a user. Furthermore, some embodiments of the present invention allow items on the belt to be transported and spaced apart from one another and spaced from the processing area as additional items are placed on the belt. This may be done so that room may be freed-up for additional items to be placed on the belt and spaced apart in anticipation of processing.

In some embodiments of the present invention, the transporting belt moves items forward automatically when a customer is positioned at the scanning and tendering unit. Moreover, items may be moved forward intermittently as items are cleared from the staging area next to the scanning and tendering unit.

As outlined in Fig. 3, which illustrates a method embodiment of the present invention, the system senses items as they are placed on the item transportation/conveyor belt. The belt is activated and then moves the items forward incrementally item by item so as to prevent all the items collecting in one spot on the item transportation/conveyor belt. In addition, the incremental belt movement generated from the unloading of items continues until the system senses the items for purchase have reached the end (the part of the belt closest to the scanning and tendering unit). At this point, the belt stops until the customer has finished unloading their items for processing. Item movement is made possible, for example, through the use of on/off light emitter and detector conditions.

Once items are positioned on the item transportation/conveyor belt, the customer may move to the scanning and tendering unit to continue the transaction. The system may then sense the customer's presence at the scanning and tendering unit and automatically move items toward the customer/processing area for processing and bagging.

The item transportation/conveyor belt may then incrementally move items to the scanning and tendering unit as the customer removes items from the belt until all items are processed. This movement may also take place via a switch or other manual device. Accordingly, a manual on/off switch may be provided in the event a customer wishes to control the belt manually or if an emergency situation should arise (i.e., to turn off the belt).

The invention may be deployed in a number of self service and conventional operation configurations including use as a self checkout only (cash and/or credit payment) and use as a conventional check stand (attendant accepts payment – cash and/or credit).

In one embodiment of the present invention, an apparatus for transporting items for purchase at a checkout location may include a conveyor and a start sensor positioned at a first end of the conveyor. The conveyor transports one or more items upon the start sensor sensing the one or more items. The apparatus may also include a stop sensor positioned at a second end of the conveyor. The conveyor may be stopped upon one or more items being sensed by the stop sensor.

In another embodiment of the present invention, a method for transporting items along a conveyor for a checkout system may include starting a conveyor in a transporting

direction upon an item being placed in proximity to a start sensor, transporting the item beyond the start sensor and stopping the conveyor prior to the item reaching an end of the conveyor if a checkout sensor positioned in a checkout area indicates that a user is absent at the checkout area. The method may also include transporting the item toward the end of the conveyor if the checkout sensor indicates a user is present at the checkout area, transporting the item toward the second end of the conveyor upon a second item being placed in proximity to the start sensor and stopping the conveyor upon the item being sensed by a stopping sensor.

In yet another embodiment of the present invention, a self-checkout system may include an apparatus for transporting items for purchase at a checkout location. The apparatus may include a conveyor and a start sensor positioned at a first end of the conveyor. The conveyor transports one or more items upon the start sensor sensing the one or more items. The apparatus may also include a stop sensor positioned at a second end of the conveyor, where the conveyor is stopped upon one or more items being sensed by the stop sensor.

Other embodiments of the present invention may include computer readable media having computer instructions for performing methods according to the present invention as well as application programs for performing such methods.

The embodiments of the present invention will become even more clearer with reference to the drawings included herewith and the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of components of a system according to another embodiment of the present invention.

Fig. 2 illustrates a system according to an embodiment of the present invention.

Fig. 3 illustrates a flowchart of a process according to one embodiment of the present invention.

Fig. 4 illustrates a flowchart of a process according to another embodiment of the present invention.

DESCRIPTION OF THE EMBODIMENTS

The preferred embodiments will now be described with reference to the drawings. In its preferred application, the present invention will be described with reference to a self-checkout system. The system is not, however, applicable only to self-checkout, but can be used with manual or conventional lanes in a variety of convenience stores, grocery stores, book and novelty stores, mass merchants, warehouse stores, drug stores or other retail establishments. The system may also be applied to non-retail establishments such as, for example, public libraries.

Accordingly, as shown in Fig. 1, the system may include a central processing or control unit. Preferably, this unit is a digital control unit 100 which may be a computer or other digital device that processes information digitally. However, other embodiments of the present invention may be controlled through analog systems. The control unit 100 may be the same or included with a central processing unit which conducts and/or controls the shopping transaction. One of ordinary skill in the art will appreciate that one or more peripheral devices may be included with or in communication with the control unit 100 (e.g., display, keyboard, network and the like).

In communication with the control unit are one or more start sensors 102, at least one stop sensor 104, a proximity sensor 106, a manual control switch 108 and an item transportation/conveyor belt 110. Start sensors may be positioned at a the front of the item transportation/conveyor belt and are used to trigger the start of the belt when items are placed in the sensing area (e.g., the sensor is blocked by an item which is placed in the vicinity of the sensor). The stop sensor may be positioned at an end of the belt closest to a checkout/processing area. The stop sensor may be used to stop the belt from moving if it is blocked by an item. The proximity sensor may be used to sense that a customer (or user) is positioned at the processing area, and causes the item transportation/conveyor belt to advance items towards the processing area (i.e., customer blocks sensor). The manual control switch

may be used to start/stop the item transportation/conveyor belt in the event the customer/user wants to control the progress of the belt manually or if there is an urgent need to stop the belt.

The sensors may comprise, for example, light activated sensors (e.g., infrared and the like), as well as any other sensor which may be used to indicate that an object has been placed in a vicinity of the sensor (e.g., weight sensor, radar, and the like).

A positioning of these items in a self-checkout system is shown in Fig. 2. As illustrated, start sensors 202a, 202b and 202c are positioned at the starting end 200 of a transportation/conveyor belt 210. Stop sensor 204 may be positioned at an end 234 of the item transportation/conveyor belt 210 The self-checkout system may also include processing/scanning area 236, which may include a proximity/processing sensor 206. The manual on/off switch 208 for the item transportation/conveyor belt may be positioned between the end 234 of the conveyor and the processing area 236. The system may also include a scanner scale 212, a monitor 214, an electronic payment pin-pad 216, a coupon acceptor 218, a coin acceptor 220, a bill-currency acceptor 222, a receipt and/or coupon printer 224, a security scale bagger 226, a processor/control housing 228, a bill-currency dispenser 230 and a coin-dispenser 232.

Although the self-checkout system does not include additional conveyors to transport items away from the processing/checkout area of the system, one of skill in the art will appreciate that the present invention may be used with such checkout systems. Examples of such systems are illustrated in U.S. patent nos. 4,676,343 and 4,792,018.

Fig. 4 illustrates methods of operation of some embodiments of the present invention. Accordingly, a customer approaches a self-checkout system/lane. Upon the self-checkout system/lane being open (lane light ON)(402, 404), an item is placed by a customer on the item transportation/conveyor belt in front of one or more of the start sensors (406)(closed lane – see steps 403, 405). The sensors provide signals to the control unit to start the conveyor and transport the items forward until all three start sensors are cleared (408). If no additional items are placed on the item transportation/conveyor belt and the proximity senor is clear, the conveyor remains stopped. The conveyor may move upon the proximity sensor

being triggered (by the customer) or the manual switch for the item transportation/conveyor belt being activated (410, 412).

Accordingly, when the proximity sensor is blocked, indicating that the customer is positioned at the processing area, the item transportation/conveyor belt moves until an item on the conveyor blocks the stop sensor (414, 416). The customer removes items which block the stop sensor, scans them and places them in a bag at the security scale bagger (418). When an item which blocks the stop sensor is removed from the item transportation/conveyor belt, the belt moves forward (toward the processing area). The progression of the belt may continue for a predetermined time period (e.g., 5 seconds), or until another item on the belt blocks the stop sensor (420).

If, for example, at step 416, the proximity sensor is clear, indicating that the customer is not at the processing area (422), additional items placed in front of one or more of the start sensors will be transported by the conveyor until, preferably, the item clears all three start sensors, or until an item blocks the stop sensor (424). Even when the proximity sensor is blocked (i.e., a customer is positioned adjacent the processing area), the conveyor may not move until either more items are placed on the conveyor, the manual switch for the conveyor is activated or an item which is blocking the stop sensor is removed from the conveyor. The removed item may then be scanned at the processing area and bagged (see steps 426, 428-442).

Upon the item transportation/conveyor belt not transporting items upon the occurrence of, for example: items placed near one or more of the stop sensors, additional items being placed near the stop sensors, and (for example) the customer blocks (i.e., activates) the proximity sensor, the customer may start the conveyor moving by pressing the manual start/stop switch for the conveyor. This may then start the conveyor moving for, preferably, a predetermined time period (e.g., 2-10 seconds)(see steps 444-464).

In one embodiment of the invention, activation of the start/stop switch may "reset" the system such that, for example, the software and hardware driving the system is reset to fix an error that may have occurred therein. Thus, after an initial activation of the start/stop switch, the customer may not need to activate the switch again.

Having now described some of the embodiments of the invention, it should be apparent to those skilled in the art that the foregoing is merely illustrative and not limiting, having been presented by way of example only. Numerous modifications and other embodiments are within the scope of ordinary skill in the art and are contemplated as falling within the scope of the invention. The contents of any references cited throughout this application are hereby incorporated by reference. The appropriate components, processes, and methods of those documents may be selected for the present invention and embodiments thereof.